



### Wild Turkey Dispersal

Following initial stocking in an area, turkeys may travel several miles to find suitable habitat. With the breakup of winter flocks in March and April, subadult (9-10 month old) turkeys frequently disperse one to 10 miles to establish new home ranges. Dispersal helps turkeys establish themselves in areas that previously had none, and ensures that breeding stocks mix, producing healthier strains of birds.

Radio-marked hens released on the Southern Unit of the Kettle Moraine State Forest in 1986 dispersed from 0.3 to 4.0 miles (average 1.8 miles) from the mid-winter release site by the time they nested in early May. Studies of radio-marked turkeys in Vernon County found that gobblers in spring dispersed on average about one mile from their winter home ranges. The maximum dispersal distance recorded for gobblers was 5.3 miles. Two subadult hens moved up to 8 miles and another traveled 12 miles (straight-line distance from release site to radiotelemetry location). The longest movement was over 40 miles during spring for a radio-equipped subadult hen.

## WILD TURKEY POPULATION DYNAMICS

**P**opulation dynamics is the study of how wildlife populations change in size over time. Changes in population size are caused by births, deaths, and movements of individuals. When births and movements into an area are greater than deaths and movements out of an area during a given year, the local population will increase; the reverse produces a population decline. By reintroducing turkeys into new areas DNR managers spread turkey populations throughout Wisconsin. Subadults dispersing after brood flocks broke up helped accelerate the spread of turkeys into previously unoccupied areas nearby. In established populations, births and deaths likely have a greater influence on population changes than movements in or out.

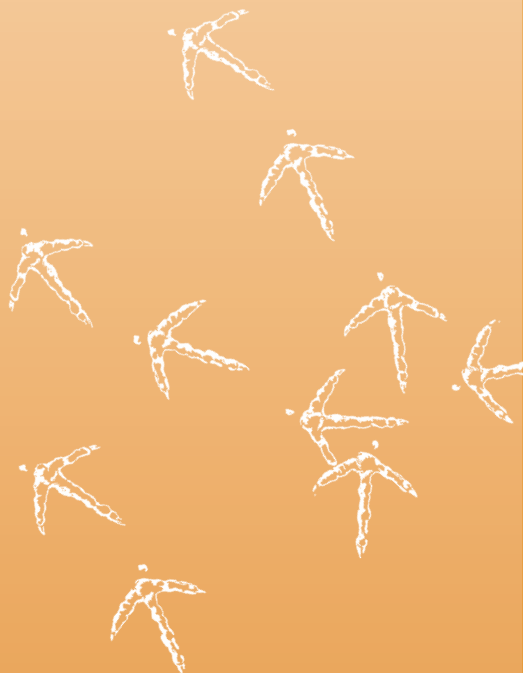
To better understand what factors influence the dynamics of an established turkey population, we used radiotelemetry to intensively monitor turkeys in Vernon County during 1988-94. Radiotelemetry allows us to closely follow the survival of both gobblers and hens and the reproductive performance of hens.

### Survival

**Hens** — About half of hens can be expected to survive in any given year. Annual survival averaged 53% and ranged from 43% to 66% among 224 radio-equipped hens monitored during 1988-94. Adult and subadult survival was similar.

Seasonal survival rate estimates indicate when most deaths occur. Seasonal survival was lowest for hens between mid-March and mid-July, averaging 72% (72 out of 100 birds alive in mid-March survived to mid-July). This period includes breeding, egg-laying, incubation, and early brood-rearing. Hens are more vulnerable to predators at this time since they spend about six weeks roosting on the ground, tending their nests or young. Survival averaged 81% from mid-July to late November and was highest during winter (late November to mid-March), averaging 89%. This higher winter survival was largely due to mild conditions every winter except one during the study.

**Gobblers** — About half of adult and subadult gobblers survived from year to year. Survival was lowest during the spring hunt period when hunters harvested about one-third of the gobbler population.





## Winter Survival

While over-winter survival was generally high among radio-equipped turkeys in Vernon County, winter mortality is likely greater in the snowier northern counties and particularly where dairy agriculture is sparse. Turkeys have considerable difficulty moving through deep, fluffy snow. In these areas, then, turkeys likely have greater difficulty obtaining adequate nutrition, particularly if wild foods are scarce. Subfreezing temperatures, particularly subzero cold coupled with wind, can create added stress. During especially severe winter conditions, turkeys may remain in roosting areas without feeding for up to 2 weeks to conserve energy. They may lose up to 40% of their body weight before dying from starvation. In areas where deer have created packed trails in deep snow, turkeys likely will use these trails to gain access to food and increase the probability of surviving the winter.

Severe winter conditions are harder on turkeys in relatively flat terrain. They have difficulty scratching for food on the ground in snow especially when it is deeper than 10-12 inches. In contrast, south-facing slopes in hilly terrain receive more sunlight, so snow depths are often shallower letting turkeys locate food more easily.



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*Running water from spring seeps help to maintain snow free areas where wild turkeys can obtain green vegetation in winter.*

*Severe winter conditions are harder on turkeys in relatively flat terrain. Deep snow can limit their movements and create difficulties in scratching for food.*



MICHAEL JOHNSON



MICHAEL JOHNSON



## Long-lived Turkeys

Because the annual survival rate averages about 50%, the probability that an individual bird will live to age 5 is only about 5%. "Old Blue" beat the odds. He was captured as a jake (a subadult male) in Iowa County on January 21, 1987, and fitted with tags on each wing painted with the number 46 in blue. He and 13 other jakes were released the same day in Green County about 50 miles away. This hardy bird survived nine years. A turkey hunter found it dead in April 1995 about 10 miles from the release site.



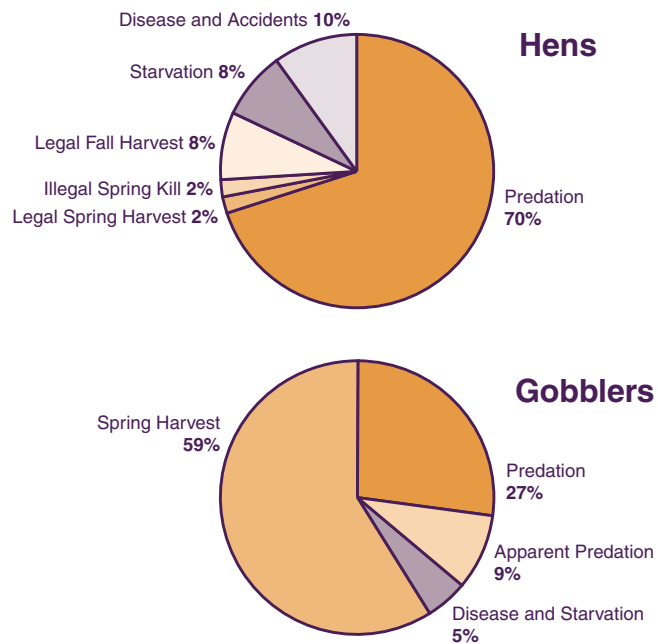
JIM McEVOY

## Causes of Mortality

**Hens** — Predators killed 70% of all radio-equipped hens, mostly during spring (Figure 16). They killed 94 of 132 hens where cause of death could be determined. It was sometimes difficult to determine which species killed the hens. However, coyotes and fox took at least 78 of the 94 predator kills. Great horned owls killed at least 2 hens on their roosts.

Starvation accounted for 8% of overall mortality, and was confined to the winter of 1990-91. During that winter, Vernon County had 49 consecutive days with fluffy snow at least 8 inches deep, including 35 days with 10 or more inches. Temperatures averaged 4°F, ranging from -22°F to 30°F. During this period, 10 radio-equipped hens, including 8 adults and 2 subadults, died of starvation. The adult birds died because the nearest food supply was quickly exhausted, and being severely weakened, they were unable to search for alternative foods. The closest standing corn was just under one-half mile away, and cow manure was just over one mile distant. There also were reports of other unmarked turkeys in poor condition in various parts of the range. This was the only severe winter during the radiotelemetry studies in 1988-94.

Legal spring harvests of bearded hens (a small percentage of females have beards and are legal game in spring) and known illegal kills accounted for about 4% of all female mortality. Legal fall harvest averaged 8% of overall hen mortality. Other causes of mortality (about 10%) included disease, natural accidents, and haying operations.



**Figure 16.** Causes of death among radio-tagged wild turkeys in southwestern Wisconsin, 1988-93.





**Gobblers** — Fifty of 66 radio-tagged gobbler deaths (76%) occurred during April-May. Most of those (59%) were due to legal spring harvest in Vernon County. Mammals, principally coyotes, accounted for 18 gobbler mortalities (27%). Another 6 apparent predator kills (9%) occurred during the spring hunt period. But carcass condition was poor, making it impossible to determine whether these birds had been crippled and not retrieved by hunters then later killed or scavenged by a predator. Three deaths (5%) were due to visceral gout, bacterial infection, and stress during the 1990-91 winter. Gobbler survival during the remainder of the year was high, with about 85% surviving from the end of the spring hunting season to the beginning of the next. Thus, spring hunting was the primary cause of death, underlining the importance of maintaining conservative harvests.



**Spring hunting was the primary cause of death for gobblers, underlining the importance of maintaining conservative harvests.**



*Left: Predators are the dominant mortality factor for wild turkey hens, especially during spring.*

*Lower left: Mammal predators, mostly coyotes, account for about 25 percent of gobbler mortality.*

*Lower right: Spring hunting is the primary cause of death for wild turkey gobblers, underscoring the importance of conservative harvests.*



PHOTOS: NEAL PAISLEY



## Reproduction

We gathered detailed information on turkey reproduction from 166 radio-equipped hens. Overall, 93% of the hens alive at the beginning of the nesting season (April 9) attempted to nest. More adults nested (98%) than subadults (79%). However, the majority of these first nest attempts of the season by all hens (86%) were unsuccessful in hatching any poults. Fifty-five percent of the hens whose first nest was destroyed attempted to nest a second time, and some adults attempted to nest a third time. In total, 22% of the hens successfully hatched a clutch of eggs, with adult hens more successful (27%) than subadults (7%). Hen success in Vernon County was much lower than that found by other researchers. In studies in Massachusetts, Missouri, and New York, hen success ranged from 39% to 50%.

The most important cause of failure was nest predation by raccoon, skunk, opossum, red fox, gray fox, and coyotes. Although most hens escaped these predators, their nests were destroyed. The average number of eggs per clutch overall was 11.2 among adults and 10.3 among subadults, and was 11.4, 10.7, and 10.0 for the first, second, and third attempts. This clutch size was similar to that found in other studies. In the end, fewer than 2 poults were hatched for each hen alive at the beginning of the nesting season.

The earliest eggs were laid in first nests on April 9 and the latest on May 25. Egg laying began for more than half of nests between April 16 and 29. Once hens have laid their clutch, incubation takes 25 to 29 days. The earliest successful nest hatched on May 20 and the latest on July 8. Most poults hatched between May 28 and June 28.

Just under half of the poults that hatched (47%) survived their first month of life. This high rate of poult mortality during the first month is typical for turkeys, and is due in part to their greater chance of being killed by ground-dwelling predators. Poults can fly short distances when they are 7-10 days old, but they continue to roost with the hen on the ground until they are about 14 days old. Poults are more susceptible to chilling during a cold, soaking rain



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*Less than one-half of the poults that hatched survived their first month of life.*

*More than 90 percent of wild turkey hens alive at the beginning of the nesting season attempted to nest.*



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and this can take a further toll early in life. Their survival chances are better as they get bigger, fly better, roost off the ground, and grow feathers that protect them from soaking rains.

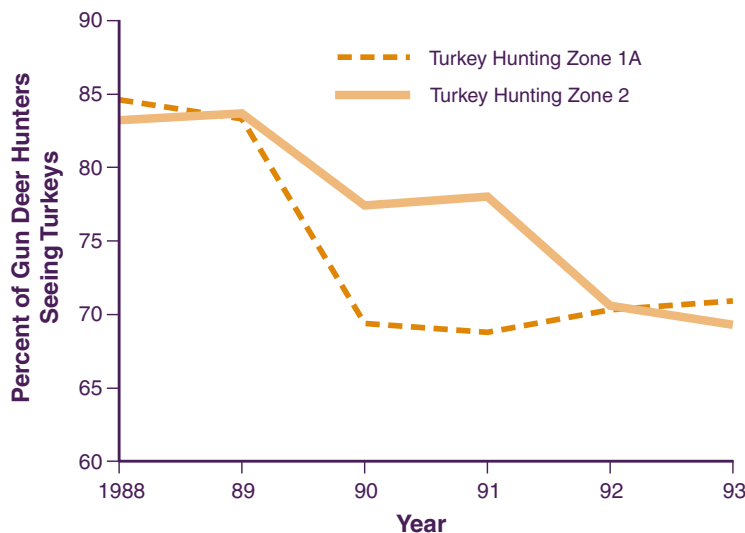
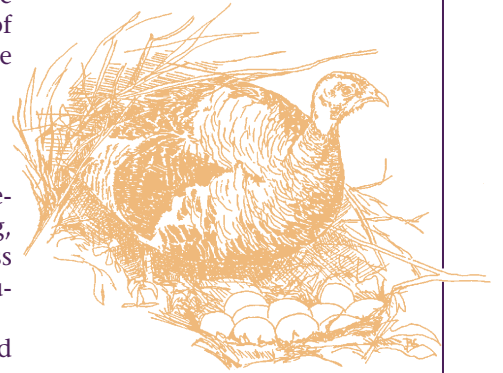
Information from harvest and landowner surveys helped us place the radiotelemetry study data into a broader perspective. The percentage of jakes (subadult males) in the spring harvest and observations of broods by rural landowners indicate that reproduction in southwestern Wisconsin was better in the previous 5 years than during the study. In 1984-88 the spring harvest averaged 38.6% jakes, compared to 28.4% in 1989-92. Landowners reported a 4.0 poult/hen ratio in broods in 1988, the first year of the survey, but reported just 3.1 poults per hen in 1989-92.

Relating these indices to regional weather data suggests that precipitation and cold temperatures in March and April affected turkey reproduction. We do not fully understand how spring weather has this effect. One possibility is that a cold, wet early spring affects the timing of plant green-up and in turn the nutritional condition of hens. Being in poor condition may make hens less attentive at the nest, leaving it more vulnerable to predation.

### Turkey Population Trends in Vernon County

We put Vernon County survival and reproductive data into a mathematical model to determine whether the population was increasing, stable, or decreasing. The model suggested that reproduction was less than mortality in 1988-94 and that the turkey population was gradually declining.

Hunter observations during the gun deer season in that period helped confirm a population decline. In 1988-93 about 5,000 deer hunters were asked to report the number of turkeys seen while hunting in southwestern Wisconsin. This survey provided an index to changes in turkey abundance and was a useful predictor of turkey harvests the next spring. Reported observations of turkeys in THZs 1A and 2 declined substantially during the study period (Figure 17).



**Figure 17.** Changes in the percentage of gun deer hunters seeing wild turkeys in Turkey Hunting Zones 1A and 2 in southwestern Wisconsin, 1988-93.





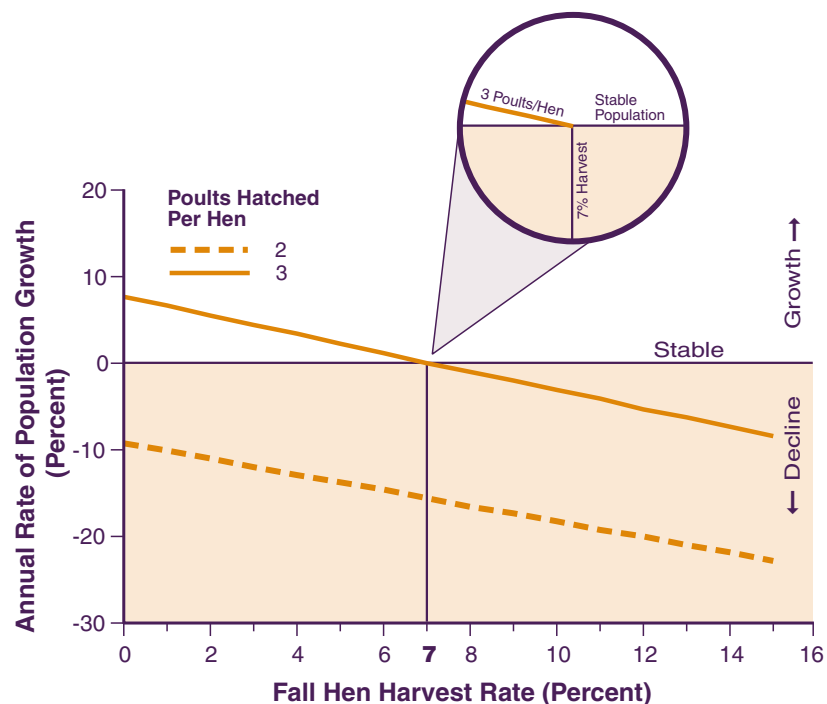
## Modeling the Effects of Reproduction and Survival Changes

The population model developed to evaluate the Vernon County population's status can also predict the effects of reproduction and survival changes on future population trends. Using this model, a manager can predict turkey population changes given different fall harvest and reproduction numbers. For example, harvesting 7% or less of hens would result in a stable to slowly increasing population, if each hen produced 3 poults. However, if reproduction were as low as 2 poults per hen, this level of harvest would cause the population to decline (Figure 18).

The model can also be used to evaluate how changes in reproduction and spring harvest rate would affect the spring harvest age structure. The reproduction level determines the number of jakes in the population while adult numbers are affected by the mortality rate. So, as harvest rates increase, fewer adults remain in the population available for harvest in future years. This results in a harvest composed more and more of one-year-old birds. Alternatively, if the harvest rate were stable, higher reproduction would also increase the percentage of jakes in the harvest. Using research results from THZ 1A, a harvest rate of about 33% of the gobblers and production of 2 poults per hen would result in adults being 70% of the spring gobbler harvest. Since many hunters prefer to harvest adult birds, maintaining a high percentage of adults in the harvest is important for hunt quality. A higher proportion of adults also means greater gobbling activity and birds that are more responsive to calling, also important for hunt quality.



**Figure 18.** Effects of fall hen harvest and reproduction rates on annual rate of population growth as simulated with a population model. With a reproductive rate of 3 poults hatched per hen, a 7% harvest rate results in a **stable** population. Lower harvest rates or higher reproductive rates lead to population growth while higher harvest rates or lower reproductive rates result in population decline.





## LESSONS LEARNED

### about Wild Turkey Populations

*By studying the population dynamics of wild turkeys in Vernon County we learned that the processes affecting turkey populations differ from place to place and across time. Annual survival rates were similar to those found in studies in other parts of the country as were the causes and timing of mortality. However, reproduction rates were substantially lower than reported in most other studies, primarily due to nest predation. Unfavorable weather (cold temperatures and precipitation) before incubation begins may affect spring green-up of vegetation and, in turn, the hens' nutritional condition and their nests' vulnerability to predators.*

*Reproductive rates were low during this study and inadequate to offset total mortality. As a consequence, this area's turkey population was declining in the late 1980s and early 1990s. Fall harvest rates of hens, shown to permit continued population growth in other parts of the country, were causing declines during this extended period of poor reproduction.*

*The research led to more conservative fall harvests, with fewer fall turkey hunting permits issued. This action and several years of better reproduction allowed the turkey population in Vernon County to recover and grow in the mid to late 1990s.*

*Over-winter survival was high in southwestern Wisconsin during this study. We expect lower over-winter survival at the state's northern limit of turkey distribution, especially in winters with prolonged periods of deep, fluffy snow. Because survival and reproductive rates can vary over time and between regions, annually monitoring turkey population status and reproduction across Wisconsin is important for managing wild turkey harvests.*



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